

Exchange Rate Asymmetry and Industrial Sector Performance

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Abstract: The study investigates the connection between the currency rate and the Nigeria's industrial sector performance. Data were obtained from the secondary sources from 1986 to 2024. It employed Kwiatkowski-Phillips-Schmidt-Shin Ordinary Least Squares, Augmented Dickey Fuller, and the unit root test to analyze the data. The Industrial Sector Performance, being the Independent Variable was affected by the variables, namely; monetary policy rate, exchange rate, and inflation. Optimal Currency Area and Purchasing Power Parity theories anchored the theoretical framework of the study. The Causality test proved that exchange asymmetry, rate of monetary policy and inflation do not influence Industrial Sector Performance in Nigeria. However, the Modified Analysis using Ordinary Least Squares unveiled that rate of exchange instability has favorable but negligible impact on Industry Performance. Similarly, Monetary policy has negative and insignificant effect while, inflation have adverse and substantial impact on industrial performance. The study concluded that unpredictability in currency rates does not explain the variation within the industrial sector Performance in Nigeria. However, it advised amongst others, strict and regulated foreign exchange rate measures be pursued in order to pave the way for increase performance of the industries and boost economic growth.

Keywords: Industrial Sector Performance, Exchange Rate asymmetry, Monetary Policy Rate, Inflation.

JEL: F31, F41, E32,

INTRODUCTION

It is of great concern and industry -wide discuss in Nigeria's exchange rate paradigm. The reason is not farfetched given the importance of this macroeconomic variable. Idris and Shuyur (2023), would contend that of a particular importance in a heavily

import dependent economy is the foreign exchange trajectory. Foreign Exchange asymmetry describes the exchange rate's volatility in the globally denominated currency of trade. A slight change or any unstableness in the rate for which the currency exchanges with its domestic counterpart could have significant effect on the economy by influencing inflation, foreign investment, and commerce (Cookey and Oladosu, 2023).

On the other hand, strengthened or currency appreciation increases the purchasing power but could unfairly affect export competitiveness, just as currency depreciation increases import costs and worsen inflationary pressure. According to Akpan and Atan (2017), exchange rate fluctuation leads to uncertainty and hampers the propensity for investment. A country's exports become more affordable for overseas consumers when its currency depreciates and ultimately, increase exports and economic activity. In the same vein, importation cost increases thereby, negatively impact on consumers of those imports including businesses and investors.

In the light of the above, currency instability could likely affect profitability of investors and businesses creating investment apathy, especially for industries. Arnassoma and Odeniyi, (2016), will contend that high import prices direct consequence of eroding currency value which triggers inflation.

Understanding exchange rate dynamics is crucial as a result of its implications especially for Industrial Sector Performance. Its role in maintaining economic stability extends to prices of products and services, a nation's overseas reserve preservation and further in influencing citizens welfare by way of purchasing power parity which cannot be over emphasized.

Cookey and Oladosu (2023), Akpan and Atan (2017), were emphatic in their contention that currency rate decisions in developing countries are frequently difficult and contentious to the effect that Governments would want to intervene in exchange rate system rather than allow market forces determine the position of the rate. This will mean that the monetary authority or Government will determine and maintain specific rates at which local currency will in return for the foreign. This currency management option implies however, that monetary independency would have been lost and worsen the situation by paving the way for currency crises.

Nonetheless, Nigeria Industrial sector performance and business productivity are said to be impacted by the rate of exchange regime of the country. Ugwu (2017), will observe that Nigeria industries are heavily influenced by the foreign exchange rates since they must secure industrial inputs such as spare parts, raw materials,

and other industrial inputs needed for the production process to churn out finished goods. Therefore, there will be adverse effect should there be any negative fluctuation in the exchange rates, (Nnamocha, Obioma, Igwemma, and Nwoko, 2015). Stable exchange rate and thriving foreign market are essential to the positive industrial sector performance. Similarly, Amassoma and Odeniyi (2016), corroborates with this position when they asserted that a country's manufacturing sector will unavoidably be impacted by these external interruptions and fluctuations in exchange rates.

It is noteworthy therefore, that rate of exchange fluctuations could cause spiral economic consequences and this ranges from financial viability and price incentives, production, international trust, balance of payments equilibrium, export competitiveness, and the effectiveness of resource allocation. Producers, however, are highly sensitive to these vagaries. Exchange rate also influences local pricing since it has impact on supply and demand globally.

In view of these, our study is to ascertain the exchange rate and instability in the industrial sector performance in Nigeria.

2. LITERATURE REVIEW

Conceptual Literature

Exchange Rate

This refers to the value of one country's currency in exchange for another. The rate determines the worth of a currency when converted to any local currency. Prevailing economic conditions defines the prevailing economic conditions defines the exchange rate and the valuation of the currency. For instance, the forces of demand and supply commonly dictate the exchange rate and the valuation of the currency. This means that when the demand of the currency increases without a commensurate supply, the rate goes higher because more people are demanding for the few available foreign currency. The reverse is the case if the demand drops. Other factors that could cause fluctuation in exchange rate are speculation, interest rate, general price level, inflation and political instability, etc.

Exchange rate sometimes is classified into official, black market and mid-market. The official rate is set or defined by the Central Bank, the Black-market rate is tagged the unofficial market which offers different rate and often referred to autonomous market. Mid- market rate, is the midpoint rate of buying and selling which appears to be the fairest when considering exchange rate.

Industrial Sector

Industrial sector refers to the segments of the economy which comprises of firms that possesses the ability to transform raw materials into completed products. (Anyawu,1997), will aver that the sector transforms raw material inputs to finished goods and could even subject some manufactured goods as inputs for further production. This means that apart from finished consumable goods, the industrial sector produces finished goods upon which other production process could depend on as input. The sector is crucial in driving the economic growth, employment and the technological prosperity of any country. It promotes the global trade, innovation and economic expansion of the nation.

Industrial sector consists of the utilities, construction, manufacturing and mining, etc. Thus, enabling the provision of gas, electricity, water and waste management, extraction of natural resources, building infrastructure, commercial projects, food processing, textiles, machinery and auto mobile, chemicals and electronics, etc.

High Gross Domestic Growth of any nation must be traceable to relatively high index of industrial output especially when associated with stable exchange rate policies. It is then imperative to advance exchange rate policies that will drive the growth of the industrial sector.

Theoretical Framework

Out research is anchored on the theories of Ideal Currency Region and Parity of Purchasing Power.

Purchasing Power Parity (PPP) Theory

Gustav Cassel, a Swedish scholar preferred the concept of purchasing power parity (PPP). The concept which establishes rates of exchange within currencies are determined by relative price of commodities and services implying that, one basket of a commodity will sell for the same amount in other countries if a single currency is used to convert prices. The level of inflation that occurred during and after the war prompted this concept. Some economist opined that purchasing power parity (PPP) of two currencies should be based on the proportion of their individual country's total prices, the currency of one country being equal to that of another as a result of this.

The purchasing power of a currency establishes a relationship between one currency and another. According to the proposition, purchasing a varied set of goods with euros could occasionally be equally as costly as purchasing the identical portfolio in US dollars particularly, when the time difference is lengthy. A currency's worth in the foreign exchange market decreases in tandem with a decline in its purchasing power (Cookey and Oladosu, 2023). We can calculate two currencies' exchange rate that is equivalent to their purchasing power by applying the buying power parity concept. Because exchange rates are unpredictable, a theory that makes it possible to calculate the currency exchange rate of other countries and the Nigerian Naira for instance, is therefore, pertinent. In view of the value of the Nigerian currency as well as the currencies of other countries, we can be sure the currency rate will possess the desired impact on the economy with this estimate.

Important facts to note in PPP are that the concept considers that the cost of equivalent item is the same across countries, and Exchange rates must make adjustments to level the playing field for costs of commodities in different countries.

Since PPP can be used to predict long term exchange rate movements, compare standard of living among countries, it becomes very apt to anchor our study on the Nigeria industrial sector shocks to response of Exchange rate on such theory.

Optimal Currency Area

McKinnon (1963) and Mundell (1961), proposed the theory of Optimal Currency Area (OCA) which significantly predisposed government decisions on exchange rate regimes. It is a geographical enclave where single currency is beneficial in concert with economic integration, economic shocks and labor mobility. The theory encourages trade and stability of economic cycles. Thus, bears nexus to trade openness, shock symmetry, and the extent of labour market movement which variables affect the rate of exchange hence, the consideration in this study. In the Optimal Currency Area theory, commerce and general product manufacturing and in general, the industrial sector benefits through dropping the level of uncertainty around foreign currency rates. Stable exchange rates reduce the currency premium on interest rates, which lowers hedging costs and promotes investment. However, if comparable prices are not promptly altered, there may be decrease in trade and barrier to the growth of the industrial sector.

Optimal Currency Area is crucial when dealing with industrial sector because it eliminates exchange rate risks and reduces transaction costs. Furthermore, it

promotes single currency, thus encouraging trade through integration, enhances monetary stability thereby, reducing inflation. This theory poses a best fit for our study hence, its application.

Empirical Literature

Orekaja and Afolabi (2020), studied volatility of exchange rates and manufacturing sectors Nigerian performance. The study adopted Toda-Yamami-Moto approach in Vector Autoregressive Model. The finding revealed a negative response to industrial sector performance given foreign exchange fluctuation. Therefore, it observed that foreign exchange fluctuation could hamper the manufacturing sector performance. It recommended that monetary authority should periodically monitor and stabilize the high level of volatility pervading the nation's exchange system to increase industrial gains.

Cookey and Oladosu (2023), investigated the industrial sector performance in Nigeria and exchange rate volatility from 1985 to 2022. The study methodology was built on econometric model wherein the rectification of errors the Granger causality test and mechanism demonstrated a strong adverse impact on the industrial exchange rate. sector. Trade Openness and foreign exchange reserve exhibit positivity and significantly affect the manufacturing sector. It therefore concluded that fluctuating exchange rate greatly affect productive capacity of the manufacturing companies. The study recommended enforcement and strict adherence to monetary policies in term of foreign exchange dealing in such manner that it will stabilize the rate and increase production capacity of the industrial sector.

Alesinloye, Gambo, Yusuf and Oyegoke (2024), carried out research on Nigeria exchange rate fluctuation from 1986-2024. Their study methodology applied the Vector Error Correction Mechanism which analyzed the variables used in the investigation. A positive association was observed between production and exports in the short run. Finding reveal in the study high inflation in the rate of exchange rate as a result of the fluctuation. This was found to impact severely on the citizens standard of living. They recommended therefore that more facilities could be accorded to the manufacturing by the financial institutions, the infrastructural position of the country also need revisited to support production.

Orji and Ezeanyaeji (2022), studied the exchange rate as well and the performance of industrial sector from 1990 to 2020. The cointegration regressed test of the study which form part of the methodology indicated a devaluation in the

exchange rate, which constraints the manufacturing industry to the extent that price increase worsen manufacturing sector's potential for production. The researchers recommended policy formulation that may favour exchange rate for the benefit of market manufacturers.

Nwikina, et al. (2025), looked at the manufacturing sector performed from 1985 to 2022 in consonance to exchange rate. It proxy exchange rate by real exchanged rate, trade openness, and external reserves whereas, the manufacturing sector's performance was evaluated using the Gross Domestic product. The study conducted Cointegration, the unit root test, and the error correction process on the data obtained from the secondary sources. It revealed that the external reserve possesses a favorable and significant impact on the manufacturing performance. It further established that the manufacturing sector's performance is significantly impacted by the exchange rate. Thus, suggested that government create feasible and efficient trade regulations in order to expand the market and liberalize commerce to attract international investors.

3. METHODOLOGY

Our model is built in line with the econometric techniques of Toda-Yamamoto (1995) estimation technique; Modified Ordinary Least Square, enhanced Kwiatkowski-Phillips-Schmidt-Shin and Dickey-Fuller unit root tests. Toda and Yamamoto (1995). The choice is suggestive of its simple process that necessitates increased VAR estimate. Guaranteeing robust testing procedure.

Model Specification

The variables adopted the linear regression analysis model of Odey and Agunobi (2023) demonstrating rate of inflation, exchange rate, and the real interest rate which could impact on the performance of the manufacturing sector. Proxy for the industrial sector's performance referred as the dependent variable is the manufacturing sector growth rate, hence, $GDPmfg = f(Fx, Inf \text{ nd } RInt)$. The independent variables, are the time bound indices that necessitates the change.

Thus;

$$MSGR = f(EXR, MPR \text{ and } INF) \quad (1)$$

Mathematically expressed for Equation (1) as:

$$MSGR = \delta_0 + \delta_1 EXR + \delta_2 MPR + \delta_3 INF \quad (2)$$

Econometrically stated as equation (2);

$$\text{MSGR} = \delta_0 + \delta_1 \text{EXR} + \delta_2 \text{MPR} + \delta_3 \text{INF} + \mu \quad (3)$$

Where:

MSGR = Manufacturing Sector Growth Rate

EXR = Exchange Rate of Nigerian Naira to US Dollar

MPR = Monetary Policy Rate

INF = Inflation Rate

Δ_0 = Manufacturing Sector Growth Rate values of independent variables

MPR, and INF) are zero.

δ_1, δ_2 , and δ_3 = coefficients of EXR, MPR and INF respectively.

μ = Error Term

a priori expectation;

$\delta_1 < 0$ or $\delta_2 > 0$ while $\beta_2, \beta_3 < 0$

4. DATA PRESENTATION, RESULTS AND DISCUSSIONS

Table 4.1: Augmented Dicky Fuller Unit Root Test for Stationarity

Variable	ADF	Critical Value 5%	Order of Integration	Probability
MSGR	.5.271039	.2.943427	1(0)	0.0000
EXR	.6.982336	.2.948404	1(2)	0.0003
MPR	.3.290442	.2.943427	1(0)	0.0226
INF	.5.740639	.2.945842	1(1)	0.0000

Source: Author's Computation (2025)

MSGR and MPR are stationary at order zero [1(0)]. Given that their t-cal > t-tab in absolute term while the probabilities are less than 0.05 (0.0000 and 0.0003, 0.0226, and 0.0000) respectively, EXR is not moving at the second difference while INF at the first difference, is stationary, and at 0.05. is a sufficient ground to carry out Kwiatkowski/Phillips Schmidt-Shin (KPSS) confirmatory analysis.

Table 4.2 Kwiatkowski-Phillips-Schmidt-Shin Unit Root Test

Variable	KPSS	Critical value 5%	Order of Integration
MSGR	0.213002	0.463100	I (0)
EXR	0.226184	0.464000	I (2)
MPG	0.261515	0.464200	I (0)
INF	0.375452	0.464300	I (0)

Source: Author's Computation (2025)

MSGR, MPR, and FNF are stationary at order zero 1(0), employing the KPSS stationarity test results, whereas EXR is at 0.05 for the second difference, stationary. Since their respective KPSS worth are lesser than the critical value of 0.464000 at 0.05. There is now enough theoretical grounding to perform validation analysis, thus;

Table 4.3: Confirmatory Analysis

<i>Variable</i>	<i>ADF</i>	<i>KPSS</i>	<i>Decision</i>
MSGR	1(0)	1(0)	Conclusive Decision (Non-Stationary
EXR	1(2)	1(2)	Conclusive Decision (Non-Stationary
MPR	1(0)	1(0)	Conclusive Decision (Non-Stationary
INF	1(1)	1(0)	Conclusive Decision (Insufficient Information

Source: Author's Computation (2025)

Arising from the above two-unit root tests namely, Tables 4.1 and 4.2, the confirmation result in Table 4.3 signifies that MSGR and MPR are static at order zero [1(0)], while EXR is stationary at the second difference. On the contrary, unit root decision for the

INF variable appears to be in limbo hence; the VAR models will only include one additional lag (dmax=1) when applying the causality test. We therefore adopt a suitable lag duration to run a cointegration test

Table 4.4: Lag Length Selection for Dependent Model

<i>Lag</i>	<i>Logl</i>	<i>LR</i>	<i>FPE</i>	<i>AIC</i>	<i>SC</i>	<i>HQ</i>
0	4305.531	NA*	5.3e-112*	-244.8875*	-243.9987*	-244.5807*
1	4190.075	-171.5340	1.0e-108	-237.3757	-235.7759	-236.8235
2	4097.685	-116.1477	5.4e-106	-231.1820	-228.8712	-230.3843
3	4035.280	-64.18804	5.9e-104	-226.7017	-223.6799	-225.6586

Source: Author's Computation, 2025.

* Shows lag order selected by the criterion

The Hannan-Quinn, Akaike, and Schwarz information criteria are considered in Table 4.4 above shows the lag length of zero out of three lag lengths at most. The AR polynomial's inverse roots and LM Tests for VAR Residual Serial Correlation were applied and it was discovered that the VAR is well specified. However, there is an autocorrelation matter in the optimal lag at 5% level. Furthermore, it was observed that not the unit circle contains all of the opposite roots of the traits, AR polynomial and it is not all of the values of modulus are lower than 1 as some are greater than one. Accordingly, the VAR does not satisfy the state of stability.

Toda-Yamamoto Granger Causality Test for Dependent Model

Toda and Yamamoto's (1995), Granger Causality test is computed Using Block Exogeneity/VAR Granger Causality Wald Tests and presented in the below Table. The test result proves a chi-square distribution which required lag duration and probability,

Table 4.5: VAR Granger Causality/Block Exogeneity Wald Tests for MSGR Model

<i>Null Hypothesis</i>	<i>Chi-square</i>	<i>Prob.</i>	<i>Granger Causality</i>
EXR does not grander cause MSGR	0.291115	0.8645	No Causality
MPR does not grander cause MSGR			No Causality
INF does not grander cause MSGR			No Causality
MSGR does not grander cause EXR	2.203694	0.3323	No Causality
MPR does not grander cause EXR	0.083195	0.9593	No Causality
INF does not grander cause EXR	0.010565	0.9947	No Causality
MSGR does not grander cause MPR	1.806794	0.4052	No Causality
EXR does not grander cause MPR	0.624028	0.7320	No Causality
INF does not grander cause MPR	2.107784	0.3486	No Causality
MSGR does not grander cause INF	7.409687	0.0246	Unidirectional Causality MSGR – INF
EXR does not grander cause INF	0.163808	0.9214	Unidirectional Causality MPR – INF
MPR does not grander cause INF	6.155210	0.0461	

Source: Author's Computation (2025)

Table 4,5 indicates that there is no causal relationship between the manufacturing sector growth rate, exchange rate, monetary policy rate, and inflation. These are shown in their probability values of 0.8645, 0.1898, and 0.0679 respectively which are more than 0.05. Additionally, there is a one-dimensional causal relationship between the manufacturing sector and growth rate and inflation which runs strictly from manufacturing sector growth or inflation rate since the probability value of 0.0246 is more than 0.05; also, there is causal relationship between monetary policy and inflation rate which runs strictly from monetary policy rate to inflation hence the probability value of 0.0461 is more than 0.05. Other variables do not demonstrate any causality. As indicated by their respective probability values from Table 4.5, there are, no correlation between monetary policy rate and the currency rate; so also, no causality between inflation and the exchange rate.

Nigeria's inflation, monetary policy rate, and exchange rate for the reviewed period did not have a direct influence on the nation's industrial sector growth rate, according to the results of the Toda-Yarnamoto Using the VAR Granger Causality/Block Exogeneity Wald Tests.

Table 4.6: Modified Ordinary Least Square Model result

<i>Variable</i>	<i>Coefficient</i>	<i>t-Statistic</i>	<i>Prob.</i>
EXR	0.002117	0.250330	0.8039
MPR	-0.389006	-1.149713	0.2585
INF	-0.187312	-2.605116	0.0137
R ²	0.786753		
Long-Run Variance	50.04275		

Source: Author's Computation (2025)

The coefficient of Long-Run Variance of 50.04275 shows that there is greater variability based on the Residual-Based Fully Modified Ordinary Least Square calculations. This follows long-run variance statistic value is statistically insignificant because it exceeds one (1). The variance over the long term is typically described Consider stationary processes of the second order as the total of all auto-covariance, or, conversely, in terms of the frequency zero spectrum.

With an R2 of 0.786753, results indicate that the overall fit is excellent. Therefore, the exchange rate monetary policy rate, and inflation are responsible for 78.7% of the systematic variance in the agricultural sector growth rate.

The remaining 21.3% of the explanation comes from outside the model. These are taken into consideration by the model's error term factors.

Nigeria being a heavy import nation, depreciation of Naira to a unit of dollar will hamper the growth of its industrial sector as a result of technology infrastructure import. However, the explanatory variables' indicator of exchange rate is positive which defies economic theory. Thus, statistically irrelevant at the 0.05 levels of significance, hence its probability value, 0.8039, and greater than 0.05. implying a depreciation of the naira thus a unit increase in dollar will impede manufacturing sector growth.

We conclude that the period under our study, exchange rate shocks have positively but slightly impacted manufacturing sector growth. The coefficient of exchange rates magnitude (0.002117) is inelastic, meaning it is smaller than unity. The fact that the magnitude is inelastic or smaller than unity suggests that, a one percent reduction in the value of the Naira will cause less than one percent increase in the country's industrial sector growth.

The monetary policy rate's coefficient is negative, thus consistent with economic theory which says that raising the monetary policy rate will negatively impact on investment and skewing the growth of the industrial sector. The coefficient is statistically insignificant at the significance threshold of 0.05 due to the likelihood

that the monetary policy rate will rise is 0.2585 thus, greater than 0.05. This means rejecting the hypothesis. Raising the monetary policy rate will impede the expansion of the industrial sector because it will negatively affect investment therefore we conclude that Monetary policy rate shocks have indirectly but not meaningfully retarded the sector. The Toda-Yamamoto Granger Causality Test, confirms that monetary policy rate shocks do not granger causes industrial sector. The Monetary policy rate coefficient's magnitude of (-0.389006) is either inelastic or less than unity. The fact that the magnitude is less than unity or inelastic suggests that, a one percent increase in the monetary policy rate will result in less than a one percent decrease in Nigeria's industrial sector growth. This is statistically important as the 0.05 levels of significance has a probability value of 0.0137, which is less than 0.05, the coefficient of inflation is negative and consistent with economic theory where increase in inflation will distort the performance of the sector as a result of increased cost of technology. We therefore accept our alternate hypothesis that higher inflation will impede the growth of the manufacturing industry. Our VAR Granger Causality/Block Exogeneity Wald Tests that confirms inflation shocks do not granger cause indicating that one percent increase in inflation would affect in less than a percent decline in industrial sector.

CONCLUSION AND RECOMMENDATIONS

Our study investigated the industrial response to exchange rate asymmetry in Nigeria. The dependent variable that was employed in the analysis was the manufacturing industry growth whereas the rates of inflation, monetary policy, and exchange were the independent variables. The Fully Modified Ordinary Least Square, Toda-Yamamoto Causality, and Unit Root tests model were utilized to calculate the specified model. The results indicate that the regressors, namely; exchange rate, monetary police rate and the inflation rate is not particularly impact on the industrial industry. However, we conclude as follows:

- (i) The monetary policy rate, that exchange rate, and inflation do not granger cause manufacturing sector growth in Nigeria from our analysis.
- (ii) Exchange rate has positive, but insignificantly influenced industrial sector growth in Nigeria as could be confirmed in our results in this study.
- (iii) The monetary policy rate negatively but insignificantly slowed the rate of expansion of the manufacturing industry. Similarly, inflation has

unpleasantly and significantly stunted industrial sector growth based on our result.

- (iv) Exchange rate shocks do not explain the variation in the industrial sector growth of Nigeria as confirmed from the results of the study.

RECOMMENDATIONS

In view of these findings, the follow up recommendations have become necessary;

- (i) In order to control exchange rate and enhance the growth of the industrial sector, tight foreign exchange rate management measures should be put in place for determining the proper exchange rate modalities.
- (ii) Government should implement effective and optimal policy that will be fiscal and monetary policies driven which will stimulate aggregate demand.
- (iii) The government should make an effort and other stakeholders to create a suitable and conducive atmosphere including infrastructural development capable of attracting foreign direct investment to enhance industrial growth in the country. This will significantly increase standard of living of the citizens and also promote income level through job creation.

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